The

Inaugural Essay

On

SUSPENDED ANIMATION

For the

Degree of

M.D.

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BY

John Chapman

of

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1826

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Introduction.

In the first dawn of physiological learning, it might perhaps have appeared vain and presumptuous, to attempt restoring to animation, an apparently dead body.

But as we now know, that the characteristick signs of life and death are often obscure (if we except putrefaction) and that no one has been able certainly to pronounce, this is vitality, or that is death; as we are also certain, that the more obvious appearances of life may be suspended, without its being annihilated; it becomes an act of criminality to neglect any effort to resuscitate, in cases of the sudden suspension of vital action.

"Shall we refuse to rake the warm ashes for a spark, which may rekindle to a genial blaze, and give new vigor to a sinking frame."

That life can exist as it were in a latent state, for sometime and still remain capable of being roused into action; and to produce all its phenomena, is established by facts so numerous and incontestible,

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It must however, be acknowledged, that all efforts at resuscitation are often ineffectual, even in cases where submersion has not long existed. It becomes then a question of much interest and importance to be answered, wether in these instances, the failure is ~~not~~ to be attributed to a defect in the method now employed for recovery, or a total extinction of life.

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Suspended Animation from Drowning

I shall commence with ascertaining the proximate cause of the disease, produced by drowning; examining the state of the vital organs, so that we may form indications of cure.

In the act of drowning the circulation becomes gradually more feeble and slow, and much anxiety is felt about the præcordia; to relieve which the person attempts to rise to the surface of the water; he then discharges a portion of water, when he again sinks. after struggling in this manner for a short time, convulsive spasms arise; the organs of respiration cease to act, and he at last expires: soon after which the skin becomes of a purple or blue cast; particularly about the face and neck; and the body sinks.

From considering that a drowned person is surrounded by water instead of air, and that in this situation he makes strong and repeated efforts to breathe; we should expect that the water would enter, and completely fill the lungs.

This opinion indeed was once very general, and still continues to prevail among the common people. but dissections have proven to the contrary; for after drowning

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dogs and cats with coloured fluids, little was found in their lungs upon examination; this circumstance may readily be accounted for, by recollecting that the muscles which form the opening into the trachea are exquisitely sensible, and contract violently upon the least irritation, as we frequently experience, when any part of the food or drink happens to come in contact with them. but after animation has been gone for some time, they relax and the lungs become filled.

If the thorax be immediately opened, the heart will be found contracting weakly; especially the ventricle and auricle of the right side, which are distended with black blood; while the left contains but a small portion, which through the thin sides of the auricle appears also black.

The cava, and all the deep seated veins are also distended with black blood.

These appearances, show that the circulation has been entirely suspended; and from the blood being collected in the right side of the heart, that a remora

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had occurd, to its passage through the lungs.

These organs are generally found in a state of greater or less collapse: When they are cut into, a frothy fluid very frequently is found in the extreme bronchial cells; demonstrating that a small portion of water has penetrated into them; but as I formely mentioned the quantity is always small except in those cases where they have been some time under water.

The stomach always contains water; somtimes a large quan-tity is found.

The brain, whose function is early suspended in this affection, appears to be nearly natural; a little more congestion is observed in the veins of the pia mater, than in subjects who have died of disease, which did not materially affect this organ; though not sufficient to produce any evil consequences.

There can be little doubt, that the death induced either by drowning or hanging, does not proceed from an affection of the brain; and indeed I believe death in either case, to be entirely independent of the brain;

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and that the greater or less engorgment of this organ, does not hasten or retard it one moment.

I shall now proceed to the best mode of resuscitation, according to the indications that have been premised. The means of fulfilling these, form the subject of the next section.

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The mode of Resuscitation or Cure.

The practice which has been adopted, for the recovery of drowned persons; has varied at different periods.

The remedies, which have been employed, have frequently tended more to the total extinction of life that might have remained, than to promote the recovery of the patient. It has been, too often marked by empiricism; the invariable consequence, of principle being deserted or despised in practice.

I shall now proceed to the indications of cure, advising those only to be employed, which I have thought useful; and rejecting the rest.

The means which are first to be resorted to, as soon as the body is obtained from the water, consist merely in conveying it to the nearest habitation, and placing it in an airy room, in which a small fire may be kindled; the clothes are then to be taken off as speedily as possible, and the body wiped dry with warm cloths or flannel; but with no more agitation or friction to the body than is absolutely unavoidable. It is then to be placed on a table overspread

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with blankets, and with a feather bed; and the body is also to be covered with warmed blankets.

While these preparations are making, medical assistance should be sought, and the apparatus belonging to the humane society, should be brought from the nearest place of deponte.

No other treatment should be pursued, until a physician is present, if there be a possibility of one being speedialy procured. When a physician has arrived at the spot, he should proceed immediately to fulfil the indications of cure; which are as follows,

First, the decarbonization of the blood, which is to be obtained by the inflation of the lungs.

Second, those which stimulate immediately, the vital organs to action, and also the system generally.

The first class of remedies, which is the decarbonization of the blood by the inflation of the lungs, may be best obtained by the following apparatus; which consists of a small ivory tube to be introduced into the trachea, curved at the extremity which goes into the fauces. (such a one as

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Coleman describes); and having the end which passes into trachea, small and round or flattened on its ~~it~~ sides. I prefer having this of some hard smooth substance; as a firm body can be passed with more ease into the trachea, than one which is flexible. The end of this tube which projects from the mouth, should be made to screw to the end of a leather tube, whose opposite end, is to be made so as to be attached to the pipe of a double bellows.

This is more eligible than the common single bellows usually employed; for with it an artificial respiration, almost as complete as the natural can be supported. But with the single bellows the use of the tube is not attainable; for it would be necessary each time compression is made on the thorax, in order to effect an expulsion of the air it contains, to remove the ivory, or unscrew the leather tube.

The inconvenience resulting from this is obvious; and if the tube be not employed, the lungs cannot be so completely, nor so easily inflated; and I have known the air to pass

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into the stomach and intestines; but this happened by neglect in not pushing the larynx strongly against the cervical vertebræ, by which means the lower part of the pharynx is kept closed, and the introduction of air avoided.

If this precaution be neglected, and the abdomen be made tense and tympanitic, the descent of the diaphragm is prevented and a principal means of performing respiration; indeed an indespensable one to old persons, is destroyed.

The principal objection to the above mentioned apparatus, is, that there is some difficulty in introducing, and keeping the tube in the glottis; but a physician who is acquainted with the structure and situation of the parts, cannot fail in succeeding to place it in the situation he wishes; and a little attention will answer to preserve it there

The following directions, however, may assist to attain a knowledge of the proper manner of introducing it.

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the mouth should be opened to its utmost extent, and the tongue drawn forwards. The epiglottis can then be distinct-ly perceived; the tongue will mostly remain in this situation; if not, it may be retained by an asistant. the fore-finger of the left hand, (if standing on the right side,) is to be introduced into the fauces, and is to be placed over the epiglottis, which should not be pushed down on the opening of the glottis; then, holding the tube in the right hand, he passes it along the finger of the left, until it has passed over the epiglottis; and with the same finger he can direct and place the extremity of the tube into the opening of the glottis.

The tongue is then to be put back into its natural situ-ation. an assistant, standing at the head of the patient, should hold the tube, to prevent its falling from the glottis; and rather push it down and forwards.

The flexible leather tube attached to the bellows, should be screwed to the ivory one; and inflation should be immediately commenced.

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If this apparatus cannot be obtained, necessity will obligate the use of that, which is at hand, and can be directly employed.

A common bellows is to be procured; the pipe of which is to be fixed into one of the nostrils, which is to be compressed round it by an assistant, who with the same hand closes the other nostril; keeping the mouth shut with his other hand. another assistant presses the larynx strongly against the cervical vertebra, by which means the lower part of the pharynx is kept closed, thus preventing the air from going into the stomach, as before mentioned. a third and fourth assistant raised on stools, one on each side of the patient, are to make compression with their hands on the thorax, whenever it is completely distended; while the physician or an assistant blows the bellows.

The atmospheric air by which the lungs are inflated, ought to be as pure as can be obtained, to this end, no more persons should remain in the room, than are wanting for assistance.

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If it should be night, no more candles or lamps should be used than are necessary. if the weather be not too cold, the windows may be raised, to permit a free circulation of air.

The next indication is to increase the heat and irritability of the cutaneous system, causing it, as it were, to solicit blood from the deep seated parts; this may be done by wrapping the body in blankets strongly wrung out of warm brine made by salt and vinegar; and removing them as they grow cold; this is much to be preferred to the warm-bath, as it can be carried on, at the same time the lungs are inflated.

The next indication, is to stimulate the vital organs to action; this may be done by Electricity, in the following manner. moderate shocks may be passed in different directions through the body, gradually increasing them. I think it a better plan, to have the body previously insulated, and electrified smartly; (but this is not always convenient for the want of apparatus.)

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The manner of applying the electric shocks, I shall say nothing about, it being so simple; and supposing every physician to understand it perfectly.

I think it quite likely that, the Galvanic pile would answer a very good purpose; one of these methods should always be tried.

Some stimulating liniment rubbed on the wrists, ankles, temples, and the parts opposite to the stomach and heart; has been reccommended; one composed of equal parts of aqua ammonia and sallad oil, well shaken together, would appear to be sufficiently stimulating for the purpose, and as it evaporates very slowly, will admit of being rubbed on without producing cold.

I shall now proceed to the internal remedies.

The intestines from their internal situation and peculiar constitution, retain their irritabelity longer than the other parts of the body, and accordingly, various means have been proposed for increasing the action of their fibres, in order to restore the activity of the whole system.

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Tobacco smoke injected by way of clyster has been recommended, but I think this a doubtful if not a dangerous remedy.

Instead of tobacco smoke, I would recommend a clyster, consisting of a pint or more of water, moderately warmed, with the addition of one or two table-spoonsful of aqua-ammonia and a tea-spoonful of strong mustard; in defect of one of these, half a gill or more, of rum, brandy, or gin may be added.

As the stomach is a highly sensible organ, and intimately connected with the heart and brain; the introduction of some moderately warm, and stimulating liquor into it, seems well calculated to rouse the dormant powers of life.

This is very conveniently done by means of a syringe and flexible tube, the quantity of fluid thrown in ought never to exceed half a pint, and may be composed of wine and water or spirits and water. but you must be careful not to give too much at a time.

As soon as the pulse or beating of the heart can be felt, the inside of the nostrils may be occasionally touched

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with a feather dipt in aqua amonia, it being found by experience, that any irritation given to the nose, has considerable influence in exciting the action of the muscles concerned in respiration

When the natural breathing commences, the cannula should be withdrawn; any further inflation that may be necessary, may be performed by blowing into the nostril.

Blood letting has been generally thought requisite, in every case of suspended animation. the practice however, does not appear to have been founded on a rational principle at first, and it has been continued from the force of custom, rather than from any experience of its good effects. the quantity of blood that can be drawn from the external veins, will not sensibly diminish the accumulation of it in those near the heart.

Besides, blood-letting, which generally tends to lessen the action of the heart and arteries in the living body, cannot be supposed to have a directly opposite effect, in a case of suspended animation; on the contrary if

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employed here, it will hazard the entire destruction of those feeble powers which yet remain, and to increase and support which all our endeavours should be steadily directed.

I think dry cups may be employed with advantage, sometimes.

When the patient is so far recovered as to be able to swallow, he should be put into a warm bed, with his head and shoulders somewhat raised by means of pillows. Warm wine whey or other light and moderately nourishing drinks, should now be given, and gentle sweating promoted, by wrapping the feet and legs in flannels well wrung out of hot brine, as before directed.

If the stomach and bowels, feel distended and uneasy, a clyster, consisting of a pint of warm water with a table-spoonful of common salt, or an ounce of glauber's or epsom salts dissolved in it may be administered.

The general practice in this case is to give an emetic; but considering that the powers of the system are

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The patient should on no account be left alone, until the senses are perfectly restored, and he is able to assist himself; several having relapsed, and been lost, from the want of proper attention to them, after the vital functions were, to all appearance completely established.

Either from distension which the arteries of the lungs have suffered, or from sudden change from great cold-
-ness to considerable warmth, it now and then happens, that the patient is attacked, soon after recovery, with inflammations of some of the parts of the chest.

This occurence is pointed out by pain in the breast and side, increased on inspiration, and accompained with frequent, full, or hard pulse, and sometimes with cough. Here the taking away some blood, from the arm, or ~~by~~ the application of cupping-glasse, leeches or a blister over the seat of the pain, will generally be proper.

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three days, is by no means uncommon in those who are recovered from this, and from the other states of suspended animation; here a moderate bleeding from the neck, either with the lancet, or by cupping, may prove serviceable. These means should be persisted in for two or three hours at least; but their continuance for a greater length of time would be proper; as it is impossible to determine accurately, the moment when life has entirely ceased, so as to be no longer recalled.

While therefore the most distant hope remains, that life can be restored, it is an act meriting the severest censure, it is a measure almost amounting to a crime, to desist from exertion.

I cannot terminate this essay, without acknowledging the many obligations, under which I labour to the Professors of the University, for the instruction I have derived from their truly valuable lectures, and for their willingness to impart information.

That they may long continue the ornaments of the

chairs, which they now fill, with annually increasing fame to themselves, and advantage to their pupils, is my fervent wish.